TRACER
FAI/IGC Flight Data Recorder
by
DSX

User's Manual

Version 3.4

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Web: www.d-s-x.com; email: info@d-s-x.com; T: + 41 78 688 59 18

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Technical and operation description

In this manual there is the description of the functioning of the TRACER system and the data that it records.
There are today two versions of the TRACER: the DSX8000, with the electronic board type V4, and the DSX8001, with the electronic board V5. This last one can be easily identified because it has the USB connector for the link to the PC.
The Tracer is a flight data recorder, approved by the FAI/IGC as compliant with the tightest specifications for the “Flight recorders”: those for the category “ALL FLIGHTS”.
It can be used, therefore, to document all types of sport flights, up to the world records.
The system has an internal microphone to detect the engine start on motorgliders and on motor planes, if the option for the ENL has been activated.

The recorded data are of two types (described in this manual) and contain all the flight information required both for documenting and analysing of the flights and for doing the accountancy of the flight activity.

The TRACER records in its own internal memory, the data regarding position, altitude, time and other parameters useful for the verification of the same data, with a frequency selectable by the pilot, up to a maximum of one fix per second.
All data are recorded in a non-volatile memory, hence they can be retrieved even after a power failure, useful in case of a possible accident.
The data can be easily downloaded, through a direct connection to the PC or on a USB memory stick, to be visualized on a PC through free and commercial software programs.

A software option that can be turned on is the one that generates short files with a summary of the flight activity, with the aim of easing the operation of billing and recording of the use of the aircraft.

Main components

The TRACER is composed of the following main components, all internal to the system, unless clearly stated:

- Last generation GPS chipset
  (horizontal error <2m 50%, <4m 90%, vertical <3m 50%, <5m 90%,
  cold start 41 seconds, reacquisition 2 seconds)
- High sensitivity barometric sensor
- Microphone for the detection of the Engine Noise Level
- Real Time Clock (RTC)
- Memory of 2 Mb (DSX8000) / 8 Mb (DSX8001, optional 16 Mb) => 50 / 200 (400) h with 1 fix every 3 seconds
- Leds and button for controlling the operations
- Connection with the external through serial ports (and USB, DSX8001) and, optionally, through the USB module (external DSX8000, internal DSX8001).

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Installation instructions

The TRACER is composed of only two functional elements, the main box and the GPS antenna, that can be easily installed on board any plane also by non-specialist operators.

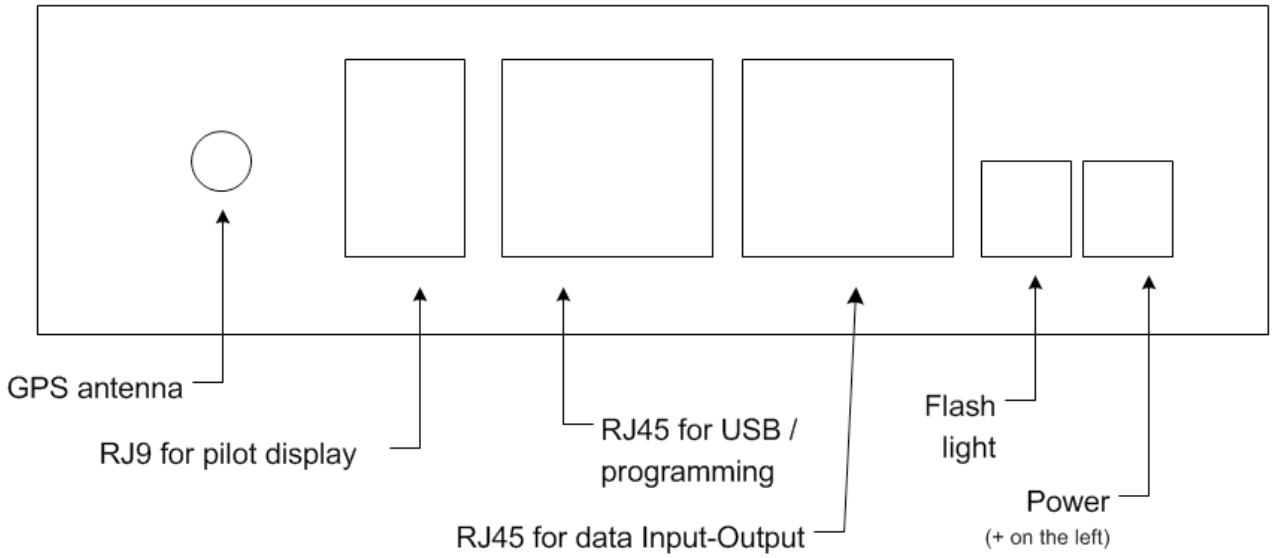
GPS antenna

The correct operation of the TRACER can be hindered by the wrong positioning of the receiver antenna of the integrated GPS.
In case of doubt about the antenna positioning, please contact DSX for assistance.

The positioning of the GPS antenna has to be performed installing it in an area that is not electromagnetically shielded.
The GPS systems are sensitive to electromagnetic radiations originating from other on board systems, therefore it's recommended to install the antenna in a place far enough from instruments that generate strong electromagnetic fields. In particular, avoid the proximity to transceivers and electric gyros.

Description of the connectors

TRACER DSX8000



The GPS antenna plug: the GPS antenna must be connected here. DSX guarantees an optimal performance of the GPS when the antenna supplied with the system is used.

The RJ9 plug is used for connecting the pilot display (used by the T-Advisor and optionally for the TRACER), with the correct connecting cable.

The RJ45 in the middle is the one to be used to connect the system to a PC for using the DSX-Win software, and to connect the external USB module.

The RJ45 on the right (see the drawing), next to the socket for the flash light, is the one that outputs the GPS data and those specific of the T-ADVISOR for other systems, like a PDA. For the description of the output data format, please require the relevant document published by DSX. It's also available, with the E-Power option, the powering of the PDA with a 5V current, output from this connector. For the pin out of this connector, please refer to the relevant paragraph.

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Anyway, bear in mind that both RJ45 plugs follow the IGC standard, with its pin out, and can hence be used also to power the system.

The plug for the flash light is an optocoupler for the automatic control of the flash light or other devices.

To the power socket the power cable must be connected through the plug supplied with the system Remember that the two RJ45 sockets can be used to power the system, with a standard IGC wiring.

The power supply through the designated green socket grants the electronic filtering to avoid the presence of interference with other on board systems. The power supply through the RJ45 connectors is not filtered and, if any interference with other system arises, it's recommended to switch to the green one.

TRACER DSX8001

The GPS antenna plug: the GPS antenna must be connected here. DSX guarantees an optimal functioning of the GPS when the antenna supplied with the system is used. Take care of screwing the connector properly.

The USB-B socket allows the connection of the system to the PC, powering the unit directly from the computer.

The RJ9 plug is used for connecting the pilot display, with the cable supplied with the T-ADVISOR.

The RJ45 in the centre is the one to be used for connecting the system to a PC with a serial connection, to use the DSX-Win program.

The RJ45 on the right (see the drawing), next to the socket for the power, is the one that outputs the GPS navigation data for other systems, like a PDA. For the description of the output data format, please require the relevant document published by DSX. It's also available, through the PDA Master option, the powering of the PDA with a 5V current, output from this connector. For the pin out of this connector, please refer to the relevant paragraph.

Anyway, bear in mind that both RJ45 plugs follow the IGC standard, with its pin out, and can hence be used also to power the system.

The RJ12 socket on the right (in the drawing), is the one used for the power of the system and for connecting the flash light (used for the T-Advisor). Below there is the description of the pins of the connector. For the numbering of the pins, please refer to the schematics of the RJ45, below.

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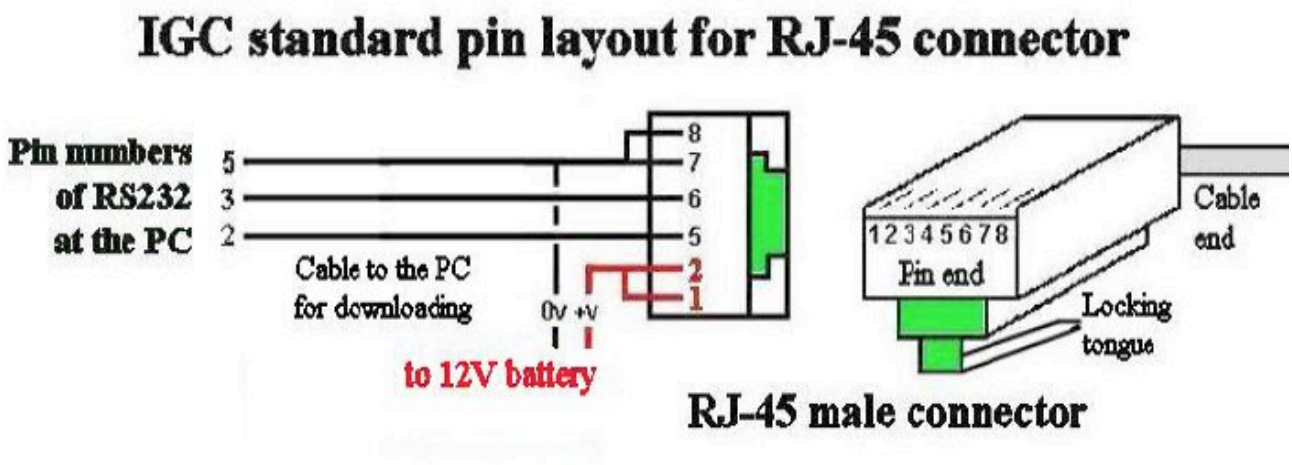
*Pins : ConnectorColor*1: +12 Vblack2: Ground (GND)red3: Opto OUT (strobo)green4: Not used5: Not used6: Ground (GND)yellow
(In some cables the colors can be different: please check always the number of the pins)

Pin out of the RJ45 connectors

The schematics of the IGC RJ45 connectors is described in the following image (source: FAI/IGC)

Pins	Function
1&2	Volts +
3&4	Spare, for future application with GFAC approval
5	Data out (AL7)
6	Data in (AL7)
7&8	Earth (Volts -ve)



In the RJ45 connector for the PDA, the pins 3 & 4 are used for the +5V power for the PDA, if the E-Power option is present. If this option is not present, the pins 3 & 4 are not used.

Please read the recommendations for avoiding electromagnetic interferences before wiring a cable.

TRACER DSX8000

ATTENTION

In the V4 models, where there are the green sockets, the polarity of all connectors is such that the positive (+) in on the pin on the left, while the negative (-) is on the right one.

An inversion of the polarity on the green connector shouldn't cause hay harm to the system, but it wouldn't allow it to function. It's possible, although unlikely, that in some cases a wrong wiring causes a permanent damage to the system.
It is, instead, sure that a damage will occur for a polarity switch on the RJ45 connectors.

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The power supply data, specified in the technical specifications, must be fulfilled at all times, to avoid damages to the system.

TRACER DSX8001
In the case of the V5 systems, it is present a protection against the polarity inversion on all connectors (the two RJ45 and the RJ12).
Also, the power supply through the RJ45 is filtered to avoid interference with other on board systems.

NOTE

If the ENERGY module is present as well, the TRACER shall not be powered directly: the power will be regulated internally by the ENERGY, avoiding to connect the power to the TRACER.
The connection of the power to the TRACER won't allow it to work.

The power supply data, specified in the technical specifications, must be fulfilled at all times, to avoid damages to the system.

Positioning of the GPS antenna

The operation of the system might be compromised by the wrong positioning of the GPS antenna.
In case of doubt about its positioning, please contact DSX for assistance.

Operation of the system

The data recording starts automatically when a speed (horizontal or vertical) is sensed to be above a threshold, for a certain period of time, or, for the setting for motorplanes, when the engine start is sensed.
In the case of the motorplanes, it is recommended to start the engine after that the GPS is locked on (see the leds description, below).
According to the latest GFAC of FAI / IGC, the recording won't stop until the power is removed from the system.

The functioning of the system is fully automatic, once it's powered and installed on board the plane.
On the TRACER there are three leds and a push button, with which all functions can be indicated and controlled.
The three leds, red, yellow and green, indicate the conditions described below.

Flight operations

- Red led steady: GPS not locked. When the GPS is locked, the red led goes off; the red led blinks, the GPS is in 2D mode;

- green led flashing at short intervals: system ready for operation;
- green led flashing slowly (at about 1 Hz): the data recording is ongoing (this condition is not depending on the GPS lock on, in fact the data recording may take place even without the GPS locked on, as well as it's possible that the recording carries on even if the functioning of the GPS is

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inhibited; the yellow led is always off in this case, because during the flight data recording the USB module is disabled;

- the yellow led is always off, in this case of flight, because every time the data recording is ongoing, the operation of the USB module is disabled, therefore it's useless to leave the USB memory stick connected.

Operations with the USB memory stick

- yellow led steady on: module/stick connected and active (it's possible to perform operations with the USB stick to set up the system or download the data recorded);
- yellow led flashing: USB busy in one of the operations described below;
- when a USB stick is connected to the system, pushing the button it will start the downloading of the data relative to the last flight recorded; the yellow led will flash while the operation is being performed;
- when a USB stick with the secret code inside, typically used by the Administration, is connected to the system, pushing the button it will start the downloading of all flight data recorded in the memory of the unit; the yellow led will flash while the operation is being performed.

Maintenance operations

- The total erase of the internal memory of the system can be done only when the unit is connected to a PC or when a USB stick with the secret code of the Administration is inserted, after that all flight data have been downloaded and the button has been held pressed for 5 seconds: at that point the leds yellow and green will flash alternatively during the erase of the memory, until the operation is completed;
- the re-programming of the system with a new firmware, with a file placed in the USB stick, will take place simply inserting the stick; during the re-programming, the leds red and green will flash simultaneously.

Summary of the information provided by the leds

	Green	Yellow	Red
GPS OFF			Steady
GPS 2D			Blinking
System ready for flight	Short blinks		
Data recording	Blinks @ 1 Hz		
USB stick ready		Steady	
Data transfer to USB stick		Blinking	
Memory erase	Blinking	Blinking	
Re-programming	Blinking		Blinking

Recorded data

The data are recorded in the non-volatile memory of the system, in two different archives that can be downloaded to the PC or the USB memory stick:

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1) A file in standard IGC format, where there are present all the data relative to all instants of the flight, recorded with the rate defined by the user, useful for verifying the flight, for documenting the flight in competitions and for the badges;

2) a DSX file, with the extension .DUV, containing the information relative to the operation of the aircraft: this file presents in few lines e concise summary of the data regarding engine start, take off, landing and engine shut down, flight and engine run time. In the case of installation on a motorplane, the option in DSX-Win has to be activated to generate this file. In the case of glider operation, the .DUV file can always be downloaded to a PC or the USB stick.

Both types of files have the name that follows the FAI/IGC standard.

Here follow the data recorded in the internal memory of the system, that are available for the downloading:

- Aircraft call sign and type (data present in both types of files, IGC and DUV)

- Pilot name (data present in both files)

- Time of engine start and geo coordinates of the place where it took place (data present in file 2); in file 1, in IGC format, it's recorded the value of the ENL, according to what prescribed by the FAI/IGC, to be able to identify, in the case of motorized glider, the moment of the engine start, during the flight.

- Take off time and geo coordinates of the place where it happened (data present in file 2 and, extensively, also in file 1)

- Landing time and geo coordinates of the event (data present in file 2 and, in details, also in file 1)

- Engine shut down time and geo coordinates of the event (file 2)

- Position (coordinates and altitude) of the plane during the flights, with a data recording frequency that can be set by the user (for everyday aeroclub activity, a fix every 3 seconds is usually enough and lends a recording time equal to 50 h; for the DSX8001 the corresponding time is 200 h); when the memory was full, the system will start deleting the older data and recording there the new ones.

The file 1), beside being used for the sporting activity, is usually used for checking the flight performed by the plane during instruction (debriefing with students) or to check the route followed, the altitude and the speed held at every moment.
The file 2) is thought for the use by the Administration, the operator of the aircraft, to easily have the data relative to the usage of the plane by the members of the club, for example, to simplify the control of the flight activity and the corresponding administrative and accounting issues.

Once that the recording is started, with the switching off of the green led, all functions relative to the USB stick are inhibited.

NOTE

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The operation of the USB module is possible only when the system is not recording flight data.

Setting of the pilot data

The setting of the data for the pilot that is going to start the flight is quickly done through the USB module, with the pilot's memory stick that contains a file prepared with the DSX-Win software, with his data.
To perform the set up of the system with the pilot's data, follow this procedure:

1. switch on the system having already inserted the USB stick in the system;
2. after the checking of the leds, the configuration file is read automatically;
3. remove the USB stick.

To set up the system with the data specific of the Administration, follow this procedure:

1. switch on the system having already inserted the USB stick in the system;
2. after the checking of the leds, the configuration file is read automatically;
3. remove the USB stick.

ATTENTION

To have in the file the data referring to the pilot, it's necessary that every pilot inserts his own USB stick in the system, before starting the engine and taking off, to perform the set up of the system.

Criteria to start / finish the data recording

When the option for generating thr DUV files has been selected, the recording starts automatically, before take off, when the engine start is detected.

Here are presented the start/finish recording criteria.

Recording of the engine start:
When the value of the Engine Noise Level (ENL), deriving from a detection by the internal microphone, is above a certain level for at least 10 fixes, continuously. This function is present in the systems with ENL and in those for the motorplanes.

Recording of the take off:
a) ground speed calculated by the GPS > 15 km/h for at least 10 fixes continuous;
b) barometric pressure variation corresponding to an altitude increase with a vertical speed of at least 2 m/s for 10 seconds.
At the moment of detecting the take off, the recording starts and in the file are saved the 20 fixes preceding the take off. For this reason it's better to let the GPS lock on few minutes before the take off. Remember also that the best performance of the GPS can be attained once it has downloaded all the ephemeris from the satellites, an operation that requires about 12 minutes.

Recording of the landing:

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ground speed calculated by the GPS < 10 km/h for at least 20 seconds continuously.
In case the GPS is not locked, the landing won't be detected and therefore, it is not listed in the file of the flight activity log.

UPDATE: the FAI/IGC requires now that the end of the data recording doesn't take place automatically, rather it keeps for an indefinite time until the power is removed from the system. Until recording of data is ongoing, the use of the USB is inhibited: switch the system off and on again to use the USB.

Recording of the engine shut down:
The engine is considered shut down when there is a fall of the ENL value below a threshold, for a number of fixes > 15.

In the case the GPS is not yet locked on (in 3D, with coordinates and altitude), the 2D coordinates will be used to record the data in the files, while the GPS altitude is set to 00000, while the pressure altitude is displayed, obviously calculated referring to the 1013.25 mb QNH. If also the 2D position wasn't available, the coordinate values would be left at 0. The time of the engine start, take off and engine shut down will be taken from the internal clock, independently from the GPS.
In this way it's not possible to false the recording done by the system, shielding the GPS antenna, and it will always be known the time of engine start, take off and engine shut down.

Download and validation of data

Through a connection of the system to a PC running the program DSX-Win or the program supplied by FAI/IGC, it's possible to download the files with the data recorded in flight. For connecting the system, use a serial cable with the pins prepared according to the IGC pin out (systems with the V4 electronic board) or with a USB cable (systems with the V5 board, that can be connected also using the serial cable).
If the option of the USB master is present, it's possible to download the recorded data into a USB stick. If the directory "FLIGHTS" is present, the data will be saved there, otherwise they will be saved in the root.

For information regarding the data downloading with the program DSX-Win, please refer to the dedicated section of this manual.

Downloading the data with the FAI/IGC program

The program from the FAI/IGC, "IGCshell.exe", with the library "IGC-DSX.dll", can be downloaded from the FAI/IGC site: (http://www.fai.org/gliding/gnss/freeware.asp). With it you can also perform the validation of the files recorded and downloaded, which means to verify that they have been recorded by a DSX flight recorded approved by the FAI/IGC, and that they haven't been modified. Even the change of one character in the file will make the validation fail.

Downloading the data with the USB stick

The downloading of the data recorded during the last flight is usually performed by the pilot itself. He will then download, possibly to the USB stick, the IGC file, with all the flight details.

The data download can take place in two different ways, but always when the system is not recording:

1. after landing (and after shutting down the engine, if present), switch off and on again the system, insert the USB stick and press the button for at least 5 seconds: the data file for the latest flight is then downloaded;

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2. at any time, different from the previous, after inserting the USB stick, and after the signal of set up of the system with the data in the configuration file, if present, press the button for 5 seconds;

   As first, the latest flight data file will be downloaded, then pressing again, the second one, etc. etc.

Downloading the data by the Administration

The Administrator of the plane uses a USB stick with a dedicated format file that allows him to change all data, except the pilot's name (position #01 in the configuration file).

The first 5 characters of the pilot's name must contain the secret code set up in the system. Be careful with upper and lower cases. Contact DSX for the secret code.
This function is active only if the 5 digits secret key is set.

ATTENTION

The USB stick of the Administrator shall be inserted as first thing right after the power on

The data download is indicated with the blinking of the yellow led, as described in the chapter regarding the operation of the system.
Afterwards, all log data will be transferred from the system memory to the USB stick, first the IGC and then the DUV files.

At the end of this operation, if the field #13 in the config file in the USB stick is “-K”, the files will remain in the unit memory without deleting them; if the field is “-E”, then the system will perform a total erase. For details about the configuration file for the USB stick, please refer to the chapter about the configuration file.

Set up of the system with USB memory stick

When the USB module for connecting the USB memory stick is present, the DSX system can be configured, through the program DSX-Win, creating a configuration file to be copied then in the root of the USB stick that will be inserted in the unit.
The system will configure itself automatically, simply, if it recognizes the file as for him (hence with his serial number).
The firmware update is performed copying the file with the firmware in the USB stick, and inserting this one in the system.

NOTE

The USB module is active only when the plane is standing still and the system is not recording data.

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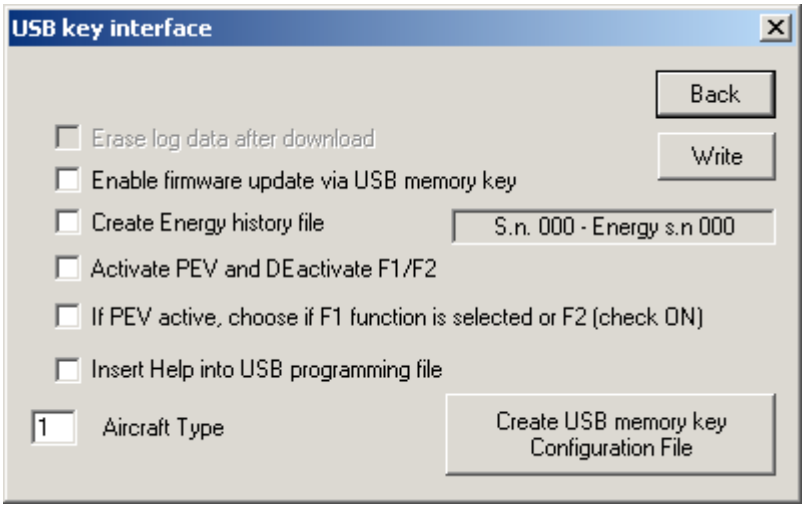
The first time that the program DSX-Win is used for this purpose, you have to rename the file *Dsx000CF.txt*, supplied by DSX as example, in *Dsx###CF.txt* , where "###" is the serial number of the DSX system to be configured (i.e. *Dsx142CF.txt* is the configuration file for the system with s/n 142). This file shall be present in the directory specified in the third line of the file *confge.ini*

* 3rd parameter directory for help and firmware files
C:\DSX\

Once the program DSX-Win is started, type the serial number "###" in the small window close to the button "USB R/W Setup" and press the button "Read data from USB file".
All parameters set up in the file for the USB stick will then appear in the DSX-Win window. At that point it will be possible to make all changes in the fields of the DSX-Win, and save them in the file for the USB.
Differently from what happens when the system is connected to the computer, preparing the file for the USB stick has no effect pushing the buttons "Write". To create the file for the USB stick, press the button "USB R/W Setup", that opens the following window:


USB key interface
Back
Write
Erase log data after download
Enable firmware update via USB memory key
Create Energy history file
S.n. 000 - Energy s.n 000
Activate PEV and DEactivate F1/F2
If PEV active, choose if F1 function is selected or F2 (check ON)
Insert Help into USB programming file
1
Aircraft Type
Create USB memory key Configuration File

Press the button "Create USB memory key Configuration File" to generate the configuration file.

Once this operation is completed, check the presence and the date of creation of the file *Dsx###CF.txt* in the directory where the DSX-Win program is. Verify that it has been saved just few minutes before, and copy it to the USB stick.
From now onwards, every time that the stick is inserted in the system, the unit will be reset with the parameters in the configuration file.

Short after inserting a USB stick, formatted FAT32, the yellow led lights on and stays on until the USB stick is inserted.

If in the USB stick there is a configuration file specific for that DSX unit, the yellow led will blink for a second, while the data are read and the unit is set up.

The set up takes place with the following steps:

1) turn on the system, having inserted the USB stick
2) after the checking of the leds (all on for few seconds), the yellow one light on
3) the yellow led blinks for a moment, while the system reads the data and sets itself up

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When the yellow led is steady on again, the system is set up with the parameters present in the configuration file in the USB stick, created with DSX-Win, and the USB stick can be removed.

Functions useful for planes used by different pilots or for a pilot who flies more planes

In the case of one plane used by more pilots in different flights, it's enough that each pilot has his own USB stick with the configuration file containing his data, and that he inserts the stick in the system before every flight, following the set up procedure.
In this way, the system will always be configured with the name and the parameters relative to the pilot that is on board, including the settings for interfacing with the PDA.
The USB memory stick is therefore the identification key for each pilot.

It is also possible to configure more systems with the same USB stick, that is a useful function in the case of a pilot flying more planes.
In this case, for each system that you want to be able to configure, there must be present on the USB stick a configuration file *Dsx###CF.txt*, where “xxx” corresponds to the serial number of the unit to configure.
The easiest thing to do is to create a configuration file for a serial number and then make as many copies as the number of planes to be used, hence the systems to configure, naming them with the serial numbers of the systems.

The file *Dsx###CF.txt* that contains the configuration data for the DSX system, is written in ASCII format, and cna therefore be edited with any text editor. It can be modified directly, following the example file supplied, without the use of DSX-Win.
Attention: do not modify the file with a word editor, that would save the file introducing unwanted characters that would make it unreadable by the system.
It is recommended to modify the configuration file only with the program DSX-Win, to avoid errors that would cause problems with the reading of the file by the system.

Update of the firmware with the USB stick

The files for updating the firmware of the DSX systems are provided only by DSX and are the only ones that guarantee a correct operation of the systems.

In the USB stick there must be present the following files:

loader6.ss
firmware file of the firmware

Inserting the USB stick in the system, the firmware update will start automatically if the version installed is different from the one in the USB stick.

The file with extension “*.ss*” must be dated after 25.03.2008 and named *loader6.ss* or following.

In the unit, insert the USB stick once the test of the leds is completed
After few seconds, there will be another beep and the red and green leds blink, indicating that the transfer of the firmware file is ongoing. The transfer process requires between 3 and 8 minutes, depending on the USB stick speed (it is recommended the use of high speed USB sticks).
At the end of the firmware transfer, the programming will start and it lasts for 10 minutes.

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The process of firmware update shall not be interrupted, and it will be indicated with the lightening of all leds. The system shall be left powered for about 12 minutes.
If the process is stopped, it will be necessary to return the unit to DSX for recovering.

At the end of the reprogramming, the system will restart automatically, erasing all flight data recorded in memory (operation that will require about 1 minute, for the DSX8001).

NOTE

The USB module will not be operative until the system has been switched off and on again.

After the firmware update, it's not possible to reprogram te system with a firmware that has already been used.
Nevertheless, it's a good rule to delete the ".ssx" file from the USB stick.

Use of the program DSX-Win

When the system is set up to record the flight data, it records the flights in IGC format in its internal memory, automatically, starting the moment when the GPS detects, for a certain time, a ground speed higher than a threshold predefined. The automatic stop of the recording is not active anymore, according to the latest requirements of the FAI/IGC, that imposes the recording until the system is powered.
The internal memory of the system has a capacity of 2 Mb (DSX8001 – board type V5: 8 Mb), which allows for a recording of about 60'000 (DSX8001: 240'000) fixes.
In the case of a recording time interval (seconds between each fix) equal to 3 seconds, the estimated recording time available is of about 50 hours. The longest recording time is estimated to be about 200 hours (DSX8000: 800 hours), with an interval fix of 12 seconds.
It is recommended to limit the time between fixes to less than 10 seconds.
The transfer of the files from the system to a computer may take place through a serial connection with the appropriate cable and the DSX-Win program supplied by DSX. Moreover the library (*igc-dsx.dll*) allows to use the IGC shell program to download and validate the flight data recorded by the system.

The DSX-Win software allows to set up the main parameters of the system, as showed below:

- data relative to the pilot and the plane, for the declaration included in the IGC files and for the data transmitted in case of activation of the SOS signal;
- list of the flights recorded in the memory with the chance of selecting those to download to the computer or to erase the memory;
- rate of recording of the fixes both in normal operation and after a pilot's event marking;

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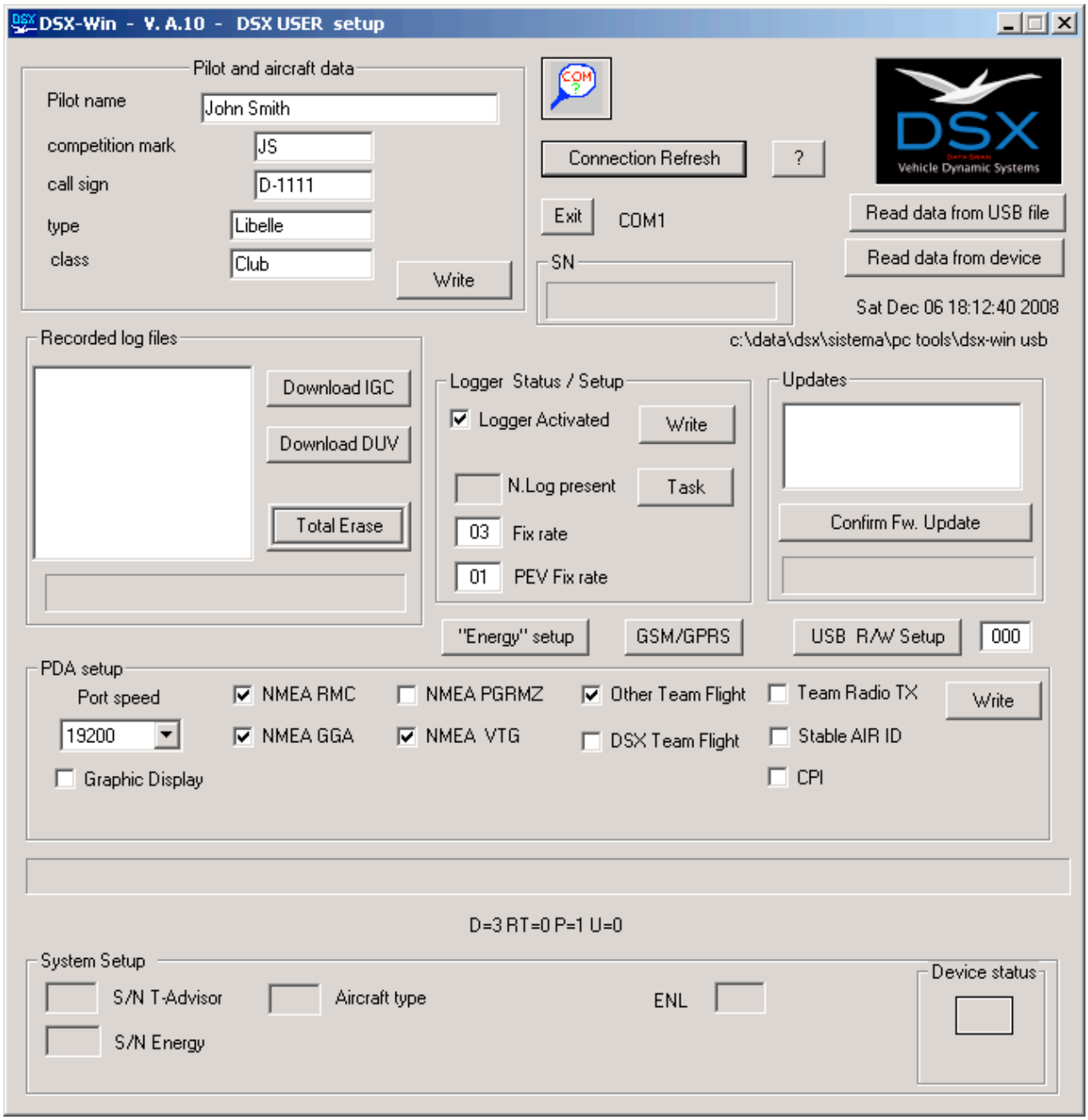
- NMEA and DSX proprietary sentences to output through the serial port, to supply them to other instrumentation connected (i.e. a PDA);
- preparation of the set up file to transfer tot he USB stick and perform the automatic set up of the system without the need for a PC connection;
- preparing of the task to be declared in the system;
- set up of the SOS operation through the GSM/GPRS module, if installed;
- set up of the Energy module or other modules, if installed.

The program DSX-Win allows also to perform the firmware updates: the firmware files available in the folder set up to keep them (see below) are reported in the window “Updates” and the button “Confirm fw Update” starts the process.



Main window of the program DSX-Win

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Installation

The program doesn't need any special installation procedure: it's enough to expand the files:

- DSX-Win.exe
- Aiuto.hlg — help file
- Confge.ini — configuration file for DSX-Win
- Loader6.ss — file used for the update of the firmware
- Dsx000CF.txt — example file of configuration for the USB stick

in a folder and start the program (double click on the file *DSX-Win.exe*).
The configuration file *confge.ini* supplied is ready for running the program from the folder C:\DSX , that is recommended to create, to copying the files in it.
For ease of use, it is suggested to make a link to the file *DSX-Win.exe* and place it on the desktop.

Once the DSX-Win is launched, pressing the button "?" the online help is launched.

Before starting the program it's necessary to select the communication port of the computer to be used.

Selection of the communication port

Edit the file *confge.ini* (double click on the file name or right button of the mouse / "Open with .." and select Notepad).
Depending on the communication type to the PC, serial or USB port (possibility only available to the DSX8001), two different configurations must be done.
In the following table it's reported what value to write in the first and sixth parameter of the *confge.ini* file, function of the connection type used (serial or USB).

	First parameter: number of COM port	*Sixth parameter:*
Serial connection	'number of the COM port'	(nil)
USB connection (DSX8001)	'number of the COM port'	U

Below the line "first parameter: COM port number to be used", write the number of the COM port that is being used to connect the cable coming from the system.

In case there is a PC with an integrated 9 pins serial COM port, the COM used will very likely be the number 1. If a PC without a 9 pins serial port, to connect the DSX8000 it's necessary to use a USB-serial converter.

In the case of the DSX8001, it's possible to connect the system to a USB port of the PC: before doing this for the first time, install the USB driver downloadable from the DSX website.

DSX-Win is capable of searching automatically for the COM port to which the system is connected to. If the search doesn't work, try again restarting DSX-Win. If it doesn't work, then it's needed to select the COM port and define it in the *confge.ini* file.

In Windows XP® and similarly other operating systems, the information can be found selecting::
"Start / Control Panel / System / Hardware / Device Manager / Ports (COM & LPT)".

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Close any other program that uses the selected COM port (i.e., ActiveSync used to connect PDA and PC): close the program pressing CTRL-ALT-DELETE and then selecting "Processes", highlight the program and press the button "End Task".
In case of presence of programs that use the COM port assigned for connecting to the DSX system, it will not be possible connecting the systems.

In the case of ActiveSync it's necessary terminating the WCESCOMM.EXE pressing the button "End Task"

At the start of DSX-Win there will be an icon indicating that the PC is automatically searching for the communication port

Every time that in DSX-Win is visible a red flag with yellow cross, it means that the serial port COM port is not free and hence DSX-Win can't use it.
It's recommended to exit DSX-Win, free the COM port and restart DSX-Win.

If the serial port is free to be used by DSX-Win, there will be the yellow icon on the right:

After establishing a connection with the system, there will be an icon with two arrows and a green layout:
In the case all the info in the boxes of the instrument are not appearing correctly, press the button "Connection Refresh" and wait few seconds.

Setting the folders

The settings in the file *confge.ini* allow defining different folders for each type of file (logs, updates, turnpoints, etc.). From version A.11 of DSX-Win, if the file *confge.ini* is not present, DSX-Win will assume that all files are in the program directory and will also put all new files in that same directory.
In the file *confge.ini*, below the writing "Second parameter: directory for IGC files", define the complete path of the directory where to download the flight data recorded.
After the writing "Third parameter: directory for help and firmware files", type the complete path of the directory where there will be the files for the firmware updates: DSX-Win will search for valid files in this directory.
Example of configuration file *confge.ini* (recommended):

```
* This is the DSX configuration file
* asterisk in first column = comments
*   ----------------------------------------------------
* 1st parameter : COM port number to be used
1
* 2nd parameter : directory where IGC files will be created
C:\DSX\
* 3rd parameter : directory where update and help files must be
C:\DSX\
* 4th  parameter : directory of turnpoint file
C:\DSX\
* 5th parameter : turnpoints file name (GPS-LOG format)
```

Indicate the directory where the data will be recorded

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Turnpoints.dta
* 6th parameter : 'U' if the com port is an USB port, otherwise “0”
U

Connection

For the serial connection with the system, the cable has to be plugged in the RJ45 socket that is on the left in the picture of the connections, and in the 8 pins socket of the PC.
For the USB connection, the socket to be used is the one close to the GPS antenna socket.
Launch DSX-Win and then connect the system to the PC.

Communication system / PC

The communication between the DSX system and the PC, might be not fast, especially if it takes place with a serial connection through a USB-serial adapter. It's therefore necessary to wait a bit to see the effect of the commands.
With the button “Read data from device” it's possible to read the parameters that are saved in the system, while with the button “Write”, the data are transferred to the system. The operation of writing needs few seconds: wait for this time to elapse, before doing other operations.
As a general rule it's always better waiting for the appearing in the communication window at the bottom, for the message “End device data read” before proceeding with any other operation.
In the case of USB connection, when the system is disconnected from the PC, DSX-Win must be closed and restarted when the system is reconnected.

In the case the power to the system is cut when it's connected to the PC, push the button “Connection Refresh”. This is recommended also when strange characters appear in any of the fields on the screen.

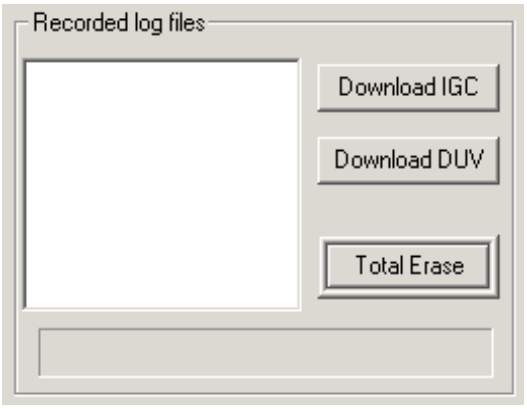
System setup

Pilot and aircraft data

When the button “Write” is pressed, to write the data of the pilot and aircraft, it's necessary to wait that the fields are read again in the system and what was written appears again; this is a sign that indicates that the data were correctly written in the system.

Flighta data recorded in memory

In DSX-Win there is the following frame:



Here are presented all flights currently recorded in memory.
Download IGC : download the data recorded in the selected file, in IGC format

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Download DUV	:	download the summary data relative to the selected file (see below for the description of the DUV file)
Total erase	:	complete deletion of the data in memory; this will not allow to download data files later on.

In the case of Windows communicating that there is an error during the download of the file and that the application (DSX-Win) will be terminated, check that all the directories specified in the *confge.ini* are correct and existing.

NOTE

The erasing of the system's memory doesn't affect the data relative to the pilot, aircraft and system settings.

Parameters of the flight recorder

Logger activated	:	select if the recording function is required to be active
N.Log present	:	number of log files present in the memory
Fix rate	:	time step, in seconds, between the recorded fixes
PEV Fix rate	:	time step, in seconds, between the recorded fixes after a pilot event marker
Task	:	opens the window for the task declaration

Firmware update

List of firmware files present in the directory specified in the file *confge.ini* or in the directory of DSX-Win, if the *confge.ini* file is not present.
The firmware update takes place in two phases: first the file is transferred to the internal memory (this operation takes about 10 minutes) and then the reprogramming takes place, programming the microprocessor (it takes about 10 minutes time).
It's possible to stop the firmware update at the end of the first phase but, once the second phase has started, it's not possible to stop the process anymore, without causing a damage to the system that shall then be sent back to DSX.

NOTE

After the reprogramming of the system, it will restart and it takes about 20 seconds (DSX8000) or 50 seconds (DSX(8001) to erase completely the memory and be ready to operate again.
After each reprogramming there won't be any data of previously recorded flights.

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ATTENTION

During the firmware update never unplug the power. In case of power failure during the re-programming of the system, it can be that the unit has to be sent to DSX for recovery.

Settings for communication with flight computer (or PDA)

Port speed	:	set the communication speed desired. It is recommended to use a speed of at least 9'600 bps
RMC, GGA, VTG, RMZ:		select the NMEA sentences that are required to be output (for navigation GGA and VTG are usually enough)
Other Team Flight	:	data with information of surrounding traffic – active only for T-Advisor
DSX Team Flight	:	data of surrounding traffic – active only for T-Advisor
Team Radio TX	:	transmission of reserved data, visible only to other authorized DSX units - active only for T-Advisor
Fixed Air ID	:	keep the radiotransmitted system identification fixed- active only for T-Advisor

Task declaration

Window for declaring the tasks to upload to the system.
Select a turnpoint from the list on the left and press the buttons “Take off”, “Start”, “Finish” or “Landing” to assign it.
With a double click on the name of the turnpoint in the list on the left, it's inserted in the task, in the first free position.
To remove turnpoints, select the checkbox on the right and then press the button “Remove turnpoint(s)”
It is also possible to insert turnpoints that are not in the list, typing their coordinates.

Store task	:	to record the task created: assign a name in the typing box and save.
Read Back Task	:	to read a task that has been previously saved.
Enter task directly into FR:		immediate declaration of the task in the system, if its connected to the PC
Create task file for USB memory key:		Create a task in a file to be copied in the USB stick to declare it in the system afterwards.

ATTENTION

The task declaration procedure is going to be fully automatic, just copying the setup file to the USB and inserting it into the system. This solution is implemented in the first firmware update and DSX-Win version of 2009.

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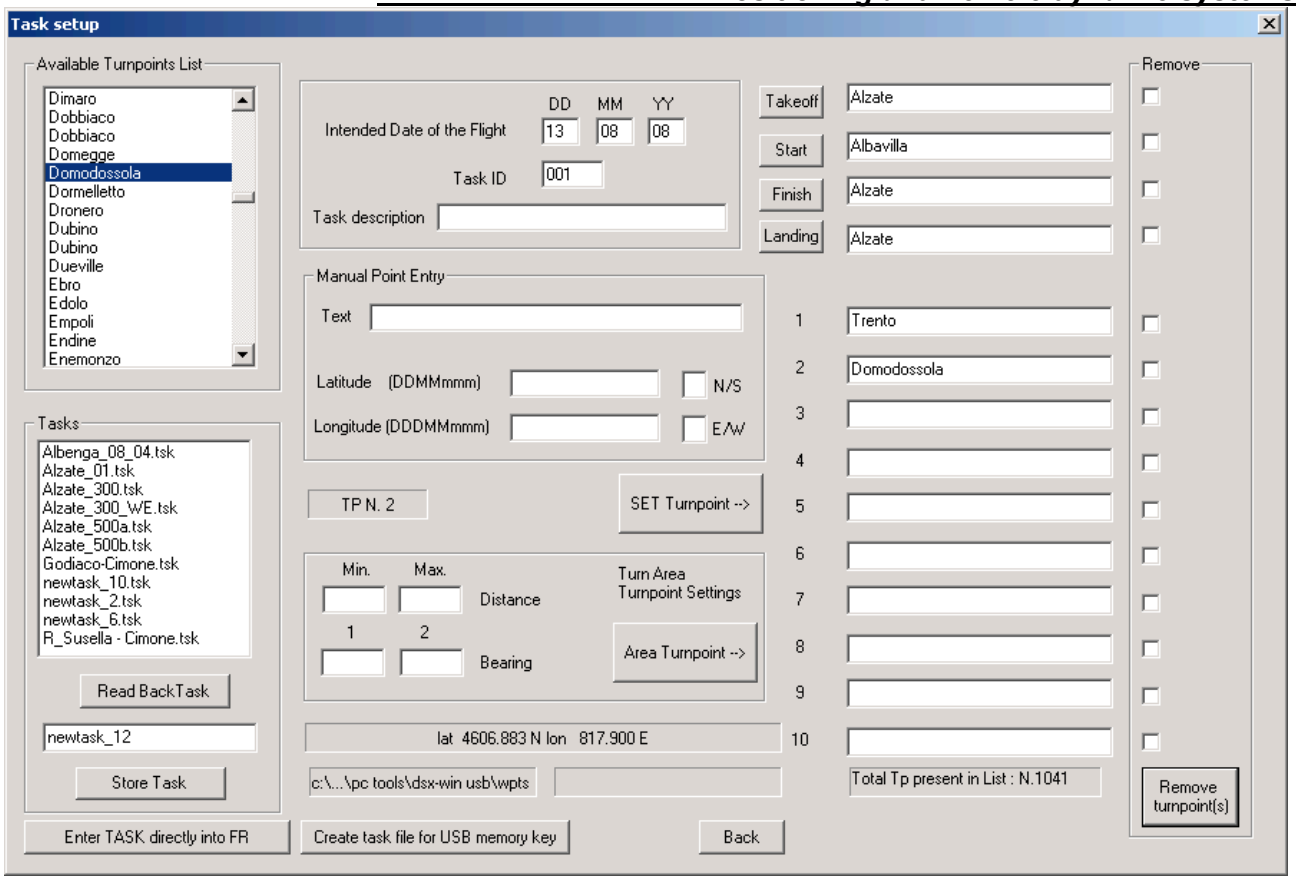
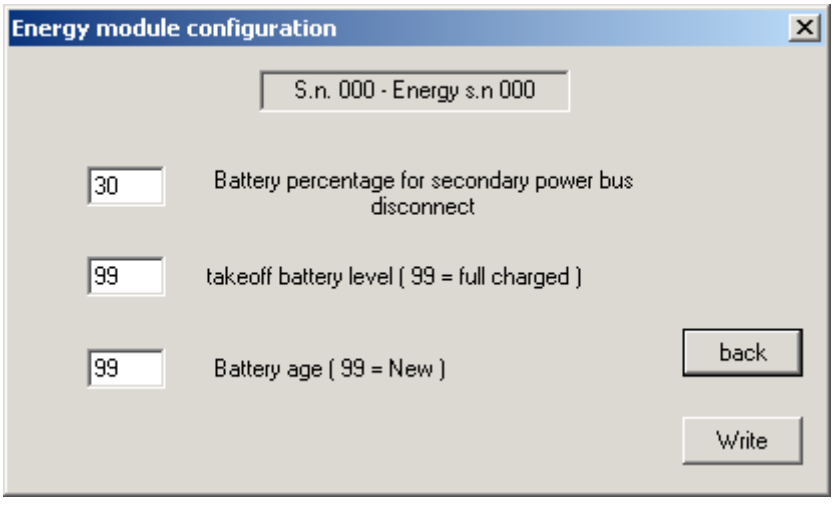


The window for the task definition



Window for the setting of the on board batteries, if the Energy is present

GSM messaging set-up

SMS Message headers	:	fixed header of all messages that will be sent for notification, transmitted after manual activation from the pilot
SOS Message header	:	fixed header for all SOS messages sent automatically or manually
Insert into SMS	:	data to be inserted in the messages
Send message	:	numbers of cellular phones to which to send the messages

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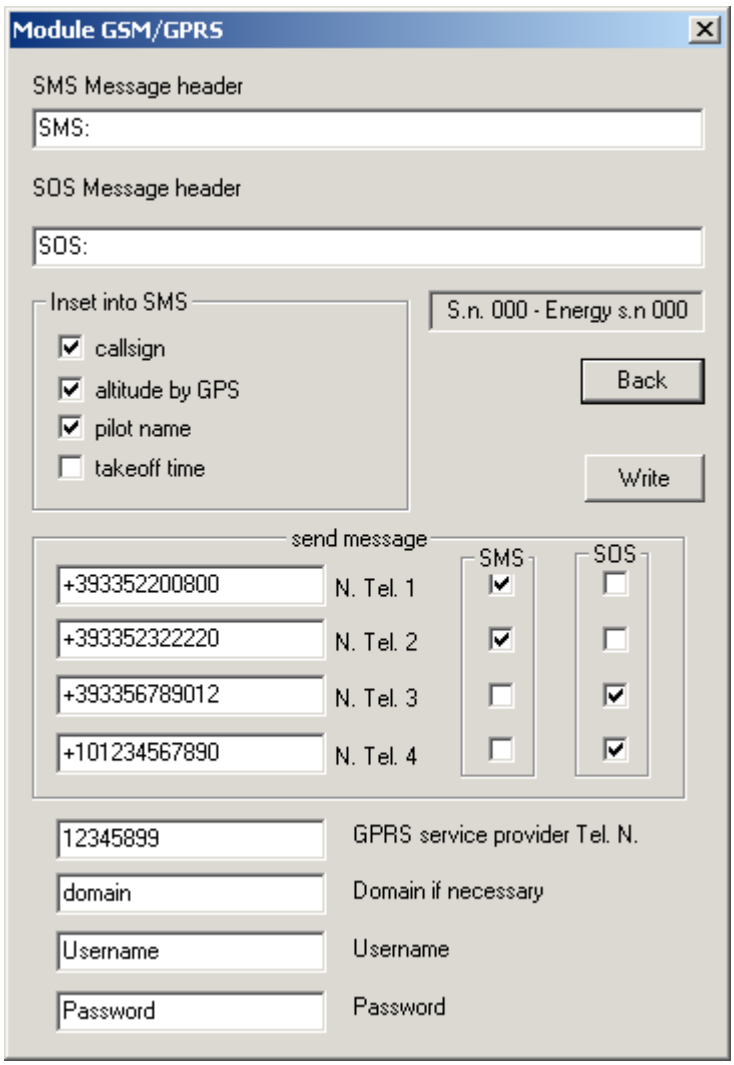

Window for setting the GSM/GPRS functions (it's recommended to insert some characters in the fields, even if the GSM/GPRS module is not present)

Help

The DSX-Win program has a Help file, that can be viewed pressing the button “?” and it presents information about each window of the program.

Data protection

All data recorded by the system are protected with a validation key for security.
In the version approved by the FAI/IGC, the data files downloaded from the system can be validated, verifying the authenticity, with a program supplied by the FAI/IGC, as already described, with the library “IGC-DSX.dll”, to be placed in the same directory of the IGC program. With this tool it's possible to detect the change to even one only character in the IGC file. Therefore it is possible to verify at anytime that the downloaded data, even if archived in a PC in the past, haven't been modified.

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The system has, internally, a sensor to detect the opening of the box, even if small, by non authorized personnel. The date and time of an opening will be recorded in a non-volatile internal memory, and readable by DSX. This applies both to the IGC approved and non IGC-approved versions.
In the case of the FAI/IGC approved version, every time the unit is open, it has to be shipped back to DSX to be sealed and used as approved flight recorder. Until the unit is not sealed, the files recorded cannot be validated.
Also in the case of the non IGC-approved version, the recording of the opening of the box will invalidate immediately the warranty.

The system with flight recording capability and FAI/IGC approval, shows the following icon in DSX-Win, when connected to the DSX-Win,

When in DSX-Win an icon like the following would appear, with a red flag,

it would mean that the unit cannot be used as FAI/IGC approved flight recorder, likely because it's been opened.
All files in IGC format coming from this unit cannot be validated by the IGC program with the DSX library.

In case in an IGC file generated by a system not opened, a writing like the following appears

HF FRS SECURITY SUSPECT USE VALI PROGRAM: Seal broken

it's necessary to validate the file with the IGC program, before considering it valid for the FAI/IGC.

Use of the recorded data

The system is conceived for:

- Downloading the flight data detailed for all instants of flight, in IGC format, with a USB memory stick or through a connection to a PC;
- Downloading the flight data and the summary files with the reports of the aircraft activity (files 1 and 2 described in this manual), with a USB stick, by personnel of the administration of the aircraft. The USB stick of the administration shall have a code in place of the name of the pilot, in the configuration file; with this code, after the files are downloaded, they can be deleted. The Administration can decide if to delete all flight data after downloading or not, with a setting to be done with DSX-Win creating the configuration file for the USB stick. These options are active with the first firmware and DSX-Win version of 2009;

- Identifying the downloaded data as coming from a certain plane, whose call sign are recorded in the file. The date and the time of the files downloaded to the USB stick are those of the moment of the take off;

- Downloading the flight data (files 1 and 2) with the USB stick of any pilot. In this case the data will not be deleted from the memory after downloading;

- Setting up the options of the system like pilot's name, time step of the data recording, GPS navigation data to be output on the serial port, etc.) with the configuration file that can be

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present on any USB stick, inserted into the system before the engine start or take off, provided that it is named with the serial number of the unit to configure (i.e. “Dsx041CF.txt” for the system with s/n “041”);

- Setting up of the protected options of the system, like the full erase of the memory, with the configuration file in a USB stick of the administration.

Files description

Configuration file

The configuration file *Dsx---CF.txt* must be present in the root of the USB stick; it is generated by the program DSX-Win and has the following syntax. The description of each parameter can be appended at the end of the file, if the option is selected in DSX-Win.

#01-John Smith	Name - Family name:	
#02-JS	Competition ID:	
#03-X-XXXX	Call sign:	
#04- Cessna 150	Aircraft make and model	
#05-motorplane	class	
#06-01	Aircraft Type (Glider = 1, Motor/Tow plane = 2):	[solo per T-Advisor]
#07-D-	Software update Activate or Deactivate (A/D):	
#10-A	**Logger**: Activate / Deactivate (A/D)	
#11-03	Seconds between fixes in normal operation (1...12)	
#12-01	Seconds between fixes in case PEM activated (1...XX)	
#13-K	Log File Keep / Erase after download (K/E)	
#14-PEV	F1/F2 function or PEV (F12/PEV)	
#15-U	If PEV selected. act as F1/F2 switch is (Up / Down)	
#20-N	**Battery Management**: Energy History file (Y/N):	[only for T-Advisor]
#21-99	Battery charge at take-off (1..99):	[only for T-Advisor]
#22-99	Battery age (1..99):	[only for T-Advisor]
#23-30	Battery status sec. bus disconnect	[only for T-Advisor]
#30-1	**PDA port and other**: Port speed (0=4800 1=9600 2=19200 4=38400)	
#31-Y	RMC	
#32-Y	GGA	
#33-N	PGRMZ	
#34-Y	VTG	
#35-N	CPI	
#36-N	TSF	[only for T-Advisor]
#37-N	NOT	
#38-Y	TeamTX	[only for T-Advisor]

File with the aircraft activity summary (.DUV)

The file presented below, with the flight data, has been downloaded to a USB stick and to a PC.

Example of complete DUV file:

Flight of 01-03-08
Pilot: John Smith
Aircraft type: single engine
Call sign: X-XXXX
Engine start : 09:48:53 Lat: 4424238N Lon: 00857744E Gps.St. A Alt.GPS:00058

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Take off : 09:49:54 Lat: 4424241N Lon: 00857746E Gps.St. A Alt.GPS:00065
Landing : 09:50:54 Lat: 4424242N Lon: 00857746E Gps.St. A Alt.GPS:00063
Engine shut down : 09:51:38 Lat: 4424241N Lon: 00857744E Gps.St. A Alt.GPS:00063
Engine warm up : 00:01:01
Engine time : 00:02:45

DUV file in the case engine shut down before landing:

Flight of 01-03-08
Pilot: John Smith
Aircraft type: single engine
Call sign: X-XXXX
Engine start : 09:33:49 Lat: 4424242N Lon: 00857747E Gps.St. A Alt.GPS:00060
Take off : 09:35:57 Lat: 4424244N Lon: 00857746E Gps.St. A Alt.GPS:00057
Engine shut down : 09:36:41 Lat: 4424244N Lon: 00857746E Gps.St. A Alt.GPS:00058
Engine warm up : 00:02:08
Engine time : 00:02:52
Other parameters can be recorded in the file according to the needs and requests.

Standard FAI/IGC file with flight data (.IGC)

The files containing the flight data follow the rules defined by the FAI/IGC standard.
It's not necessary to edit the data file, since the data can be visualized, after downloading, with software programs commonly used.

As a reference it is reported below a part of a file recorded by the system.

AXDMAC042 DSX
HFDTE010807
HFFXA010
HFPLTPILOT:John Smith
HFGTYACFTTYPE:Cessna 150
HFGIDACFTID:X-XXXX
HFCIDCOMPETITIONID:55
HFCCLCOMPETITIONCLASS:Motorplane
HFDTM100GPSDATUM:WGS84
HFRFWFIRMWARE VERSION: DSX 8.01a
HFRHWHARDWARE VERSION: DSX AC 3
HFFTYFRTYPE: DSX, Tracer 8000
HFGPS: Trimble Navigation,Copernicus,12,20000
HFPRSPRESSALTSENSOR: Intersema,MS5534,20000
I023638FXA3940SIU
B0737074344642N00722755EA003770041901908
B0737114344658N00722782EA003780042001908
……
B0737154344676N00722813EA003800042101908
B0737314344760N00722979EA003910043202607
……

Below the data in the file are described.
H records - File header
HFDTE290307
Date DDMMYY (in the example, 29 March 2007)
HFFXA010

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Horizontal precision [m] (in the example, 10m)

HFPLTPILOT:Mario Rossi

Pilot's name

HFGTYACFTTYPE:Cessna 150

Aircraft type

HFGIDACFTID:X-XXXX

Aircraft call sign

HFCIDCOMPETITIONID:55

Competition sign (if present)

HFCCLCOMPETITIONCLASS:Motorplane

Class of aircraft

HFDTM100GPSDATUM:WGS84

GPS datum: 100 = WGS84

HFRFWFIRMWARE VERSION: DSX 8.01a

Firmware version

HFRHWHARDWARE VERSION: DSX AC 3

Hardware version

HFFTYFRTYPE: Tracer 8000,DSX

Manufacturer's name, model number of the flight recorder

HFGPS: Trimble Navigation,Copernicus,12,20000

GPS manufacturer name, Model, Channels, Max altitude

HFPRSPRESSALTSENSOR: Intersema,MS5534,20000

Manufacturer name of the pressure sensor, Model, Max altitude

B records

Here follows the description of the data included in the B records, with the flight data recorded at the sample sate as set up.

B1035304546170N00909733EA003520037900908

B	=	type of record (in the IGC standard, B is the record with the flight data)
103530	=	time [UTC] 10:35:30 (HHMMSS)
4546170N	=	latitude (DDMMmmmN/S)
00909733E	=	longitude (DDDMMmmmE/W)
A	=	A o V (A = 3D fix, V = 2D fix)
00352	=	pressure altitude [m], on the 1013.25 mb at sea level (PPPPP)
00379	=	altitude [m] above the WGS84 ellipsoid (GGGGG)
009	=	spatial accuracy [m] (AAA)
08	=	satellites in use (SS)

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Web: www.d-s-x.com; email: info@d-s-x.com; T: + 41 78 688 59 18

Troubleshooting

4) The system doesn't turn on:
   a. Check the power source and the connector
   b. Check that the leds test is performed

5) For the TRACER and the ENERGY, the 3 leds perform the test more than once and the system looks like turning on and off:
   a. It's likely that this is due to the lack of power from the batteries, therefore the system is powered only by the solar panels that maybe turn into the shade: just check that the power from batteries is correct

6) The led indicating GPS not locked is on during the flight:
   a. Normally the GPS of the system can stay locked on even for high bank angles and turn rates, and partial skyview. A lock on loss might be due to a non optimal positioning of the GPS antenna: check that it's not shielded by components made of metal or opaque to radiations (like carbon fibre) and that it's not installed close to systems that generate disturbing electromagnetic fields. Take care of those systems designed to emit radiofrequency signals and those that generate alternate magnetic fields.

7) The system doesn't connect to the PC:
   a. switch off the system and close DSX-Win
   b. turno on the system, connected to the PC
   c. launch the program DSX-Win
   d. wait for the program to scan automatically the COM ports (to avoid this operation, insert the COM port number in the file *confge.ini*)

Recommendations for EM interference reduction

Due to the nature of the system, electromagnetic interferences (EMI) may occur, especially when the unit is installed in gliders with not so modern electric systems. Here are presented some hints that have shown to be beneficial in EMI reduction/suppression.

- Do not install the power cable of the units in contact with the antenna cable of a transceiver.
- When preparing a cable for the PDA, do not connect to the socket the wires that are not needed.
- Check for free wires that are connected to the main power but not connected to any utility: they shouldn't be present.
- In case of persistence of interference, a ferrite ring can be used.

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Warranty

The system is given to the user with the assurance that all design and manufacturing procedures have been conducted in a professional manner, according to the current standards for the realization of electronic equipment.
The warranty of the product is according to the regulation in force at the moment of the sale.

NOTE

It is guaranteed that the system has no need for a pre-programmed firmware update to allow its operation in the future.
It is possible that the periodic calibration of the pressure sensor is required, according to the FAI&IGC rules.

DSX will replace every unit that is demonstrated to be defective because of reasons not depending on the installation and operation by the user and that does not show any damage to the seals (mechanical and electronic).

In case of opening the box without the authorization from DSX, this reserves itself the right of not being responsible of possible malfunctions or problems of any nature in the system or in any other DSX component installed.

Every DSX module has a unique and unchangeable identification code, digitally set in the system. For the warranty and official identification, the digital code is the reference one.

Technical Specifications

Power supply	:	8 – 30 V
Power consumption (typical)	:	30 mA @ 12 V
GPS engine	:	Trimble Copernicus
Pressure sensor	:	Intersema MS5534
Internal memory	:	2 Mb (DSX8001: 8 Mb, optional 16 Mb)
Recording time	:	>50 h (DSX8001 >200 h, optional >400 h) @ 1fix every 3 s
Dimensions	:	110 x 93 x 26 mm
Weight	:	150 gr + GPS antenna
Interfaces	:	USB slave (1), serial (2), USB master (1, optional)
Data output	:	NMEA 0183 standard RMC, GGA, VTG, RMZ navigation data

---------- END OF DOCUMENT ----------

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